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THE GORDON RESEARCH CONFERENCE ON ELECTRON SPECTROSCOPY

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HELD IN WOLFEBORO (U) ARGONNE NATIONAL LAB IL

J L DEHMER ET AL 18 JUL 86 AFOSR-TR-86-2023

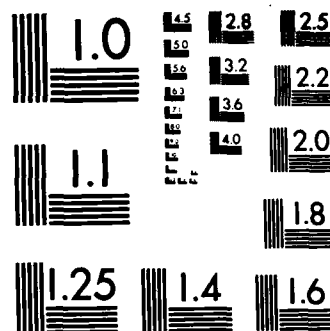
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FINAL REPORT OF  
THE GORDON RESEARCH CONFERENCE ON ELECTRON SPECTROSCOPY  
BREWSTER ACADEMY, WOLFEBORO, NEW HAMPSHIRE  
14-18 JULY 1986

AFOSR-TR- 86 - 2023

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## FINAL REPORT

### Gordon Research Conference on Electron Spectroscopy 14-18 July 1986, Wolfeboro, New Hampshire

The Gordon Research Conference on Electron Spectroscopy was held at Brewster Academy, Wolfeboro, NH during the week of 14-18 July 1986. The program, consisting of 20 invited speakers and 49 contributed posters, is attached. The invited talks were presented during morning and evening plenary sessions. Each session had a Chairman and Discussion Leader, as indicated on the program, and talks were limited to less than 45 minutes in order to reserve at least one-third of each session for discussion, which is the prime goal of Gordon Conferences. The posters were presented in two late afternoon sessions. The attendance at all sessions was excellent and the discussion was uniformly stimulating and at a high level. The organizers were very gratified by the quality and clarity of all 20 invited speakers, and comments from the attendees were very favorable.

The list of attendees is also attached showing that approximately 130 attended, including 37 conferees from 12 foreign countries. As in the case of the preceding meeting in 1984, the 1986 conference was fully subscribed. Furthermore, there was less than 50% overlap between the two, indicating the interest in and dynamic nature of the Gordon Conference on Electron Spectroscopy.

→ The scope of the electron spectroscopy Gordon Conference covers a range of modern techniques too numerous to mention, including various combinations of excitation sources (synchrotron radiation, laser radiation, electron beams, heavy ion beams, metastable atoms, etc.), targets (free atoms and molecules, adsorbed atoms and molecules, clusters, surfaces, solids, liquids and interfaces, etc.), and detectors (energy, ejection-angle, spin analyzers, often in coincidence with another observation channel, etc.). ~~Yet, the conference is not technique oriented.~~ Rather, it uses electron spectroscopy as common thread to draw together and focus diverse approaches to frontier research topics. Especially stimulating and fruitful exchanges occur across the gas phase/condensed matter boundary and between basic and applied sciences. The program for the 1986 meeting stressed a carefully selected subset of possible topics chosen to represent hot, rapidly evolving areas as well as major core areas within the broad scope of the meeting. The session titles in the attached program give a synopsis of the emphasized topics.

The conference budget of \$23,500 (\$10,500 from the Gordon Research Conferences, \$6,000 from the Air Force Office of Scientific Research, \$5,000 from the Office of Naval Research, and \$2,000 from the National Science Foundation) was used to pay the conference fee, which included room and board for the week, for the 20 invited speakers, 9 session chairs, 9 discussion leaders, the conference chairman, 4 graduate students, 6 foreign attendees, 1 postdoc, and 2 junior faculty. In addition, partial travel support was provided, according to need, to 20 speakers, 14 session chairs and discussion leaders, the conference chairman, and 5 other attendees. The success of the conference depended upon attracting the very best speakers, chairs, and discussion leaders. This would not have been possible without the supplemental financial support received from AFOSR, ONR, and NSF.

The next conference in this series will be held in 1988. The Chairman will be Dr. D. T. Pierce from the National Bureau of Standards and the Vice-Chairman will be Professor V. McKoy, Department of Chemistry, California Institute of Technology.

**GORDON RESEARCH CONFERENCE ON ELECTRON SPECTROSCOPY**

14-18 July 1986, Brewster Academy, Wolfeboro, NH

J. L. Dehmer, Chairman

D. T. Pierce, Vice-Chairman

**Monday morning, July 14:** "Photoemission and Inverse Photoemission"

Chairman                      Y. Baer  
Discussion Leader          N. V. Smith

**Speakers**

S. D. Kevan                      "Angle-Dependent Photoemission with High Resolution"  
J. Bokor                        "Photoemission From Excited Surfaces"  
P. D. Johnson                  "Inverse Photoemission from Clean and Adsorbate  
   Covered Metal Surfaces"

**Monday evening, July 14:** "Soft X-Ray Induced Ionization, Double Ionization,  
and Fragmentation of Molecules"

Chairman                      J. A. R. Samson  
Discussion Leader          D. A. Shirley

**Speakers**

I. Nenner                        "Selective Resonant Photoionization and Double  
   Photoionization of Molecules"  
E. W. Plummer                  "Fragmentation and Electron Emission from Core-Excited  
   States of Free and Coordinated Molecules"

**Tuesday morning, July 15:** "Atomic and Molecular Studies"

Chairman                      S. T. Manson  
Discussion Leader          V. McKoy

**Speakers**

R. N. Compton                  "Photoionization and Autoionization of Highly  
   Excited States"  
Ch. Jungen                      "One-Photon and Multiphoton Ionization Processes  
   in Molecules"  
W. C. Lineberger              "Photoelectron Spectroscopy of Anions and Small  
   Cluster Ions"

**Tuesday evening, July 15:** "Autoionization and Auger Processes in Solids"

Chairman                      L. C. Davis  
Discussion Leader          G. A. Sawatzky

**Speakers**

S. D. Bader                      "Autoionization in Solids"  
M. Landolt                      "Spin-Polarized Auger and Secondary Electron  
   Spectroscopy"

Wednesday morning, July 16: "Scanning Tunneling Microscopy"

Chairman                      D. T. Pierce  
Discussion Leader       E. D. Williams

Speakers

J. E. Demuth                      "Scanning Tunneling Microscopy of Semiconductor Surfaces"  
J. D. Tersoff                      "Theory of Scanning Tunneling Microscopy"

Wednesday evening, July 16: "Penning Ionization"

Chairman                      Y. Harada  
Discussion Leader       J. T. Yates, Jr.

Speakers

H. Morgner                      "Reactions of Metastable He Atoms with Molecules and Condensed Matter"  
H. Metiu                      "Metastable Quenching Ionization Spectroscopy"

Thursday morning, July 17: "Electron Energy Loss Spectroscopy"

Chairman                      A. Herzenberg  
Discussion Leader       J. W. Gadzuk

Speakers

G. King                      "Inner-Shell Excitation of Atoms and Molecules by Electron Impact"  
L. Sanche                      "Electron Spectroscopy of Condensed Atoms and Molecules"  
L. Dubois                      "Time-Resolved Electron Energy Loss Spectroscopy: A New Approach to Surface Studies"

Thursday evening, July 17: "Magnetic Domain Imaging"

Chairman                      C. S. Fadley  
Discussion Leader       H. C. Siegmann

Speaker

J. Unguris                      "Investigation of Magnetic Microstructure Using Scanning Electron Microscopy with Polarization Analysis (SEMPA)"

Friday morning, July 18:

"Basic Properties and Applications of X-Ray Absorption Spectroscopies and Bremsstrahlung Isochromat Spectroscopy"

Chairman                      P. H. Citrin  
Discussion Leader       J. A. Horsley

Speakers

T. M. Hayes                      "'Hot' Electron Spectroscopies - Is Band or EXAFS Theory the Better Approach?"  
J. Haase                      "SEXAFS and NEXAFS of Adsorbed Molecules"

# MONDAY POSTER SESSION

- Posters put up on Monday after lunch
- Poster session 4:30 - 6:00 p.m. Monday
- Posters taken down before noon on Wednesday

- M1 Photoelectron Spectroscopy of Laser Excited Silicon  
*James P. Long, M. N. Kabler, J. C. Rife, and R. T. Williams* (Naval Research Laboratory)
- M2 Two-Photon Photoelectron Spectroscopy of Pd(111) and H/Pd(111)  
*Glenn D. Kubiak* (Sandia National Laboratories)
- M3 Low Energy Electron Transmission Through Cu/Ni Quantum Wells  
*Qi-Gao Zhu, Yunong Yang, Ellen D. Williams, and Robert L. Park* (University of Maryland)
- M4 4f-Multiplet Splitting in BIS Spectra of Light Rare Earth Compounds  
*W. Grentz, C. Laubschat, C. Xue, and G. Kaindl* (Freie Universität Berlin)
- M5 Schottky Barrier Formation Studies by Temperature-Dependent HREELS  
*M. K. Kelly, G. Margaritondo* (University of Wisconsin-Madison),  
*L. Papagno, and G. J. Lapeyre* (Montana State University)
- M6 Comparison of Measured and Calculated Appearance-Potential Spectra of 3d Metals  
*N. E. Erickson, C. J. Powell, and D. E. Ramaker* (National Bureau of Standards)
- M7 Separation of Initial and Final State Effects by Combination of Electron Spectroscopy and Auger Electron Spectroscopy  
*G. Hohlneicher* (Universität zu Köln)
- M8 Resonance Auger Spectra of Silicon Compounds  
*S. Aksela, O.-P. Sairanen*, (University of Oulu), *K. H. Tan, G. M. Bancroft* (University of Western Ontario), and *H. Aksela* (University of Oulu)
- M9 Ion Production from CS<sub>2</sub> by Radiation in the Neighborhood of the C 1S and S 2P Edges  
*Robert G. Hayes* (University of Notre Dame)
- M10 Double Photoionization of H<sub>2</sub>  
*G. Dujardin, H. Le Rouzo, L. Hellner, M. J. Besnard* (Université de Paris-Sud) and *Y. Malinovich* (The Hebrew University of Jerusalem)
- M11 Carbon K-Shell Excitation Spectra of Gaseous and Condensed Cyclic Hydrocarbons  
*A. P. Hitchcock, D. C. Newbury, I. Ishii* (McMaster University),  
*J. A. Horsley, R. D. Redwing* (Exxon Research and Engineering Company), *J. Stöhr* (IBM), *A. L. Johnson* (National Bureau of Standards), and *F. Sette* (AT&T Bell Laboratories)



- M12 Autoionization from the Lone Pair Orbitals of Molecules Containing Iodine  
*T. A. Carlson, P. Gerard* (Oak Ridge National Laboratory),  
*B. P. Pullen* (University of Southeastern Louisiana), *F. A. Grimm*  
 (University of Tennessee), and *M. O. Krause* (Oak Ridge National  
 Laboratory)
- M13 Resonance Structure in the Vibrationally Resolved Photoelectron Branching  
 Ratios and Angular Distributions of the  $2\pi^{-1}$  Channel of NO  
*S. H. Southworth* (Los Alamos National Laboratory), *A. C. Parr*,  
*J. E. Hardis* (National Bureau of Standards), and *J. L. Dehmer*  
 (Argonne National Laboratory)
- M14 A Variable Energy Photoelectron Study of the Valence Levels and I 4d Core  
 Levels of  $\text{CF}_3\text{I}$   
*B. W. Yates, K. H. Tan, G. M. Bancroft* (University of Western  
 Ontario), and *J. S. Tse* (National Research Council of Canada)
- M15 A 4th Order Green's Function Approach to the Calculation of Satellite  
 Lines  
*W. von Niessen, P. Tomasello* (Technische Universität Braunschweig),  
 and *J. Schirmer* (Universität Heidelberg)
- M16 An Interchannel-Coupled Shape Resonance Observed by Dispersed  
 Fluorescence  
*E. D. Poliakoff, M.-H. Ho* (Boston University), *G. E. Leroi* (Michigan  
 State University), and *M. G. White* (Brookhaven National Laboratory)
- M17 Molecular Photoionization Calculations with Numerical Continuum  
 Wavefunctions  
*F. P. Larkins and J. A. Richards* (University of Tasmania)
- M18 Photoelectron Spectroscopy of Short-Lived Molecules in the Vapor Phase  
*J. M. Dyke* (The University of Southampton)
- M19 Fragmentation of Nitrous Oxide by Monochromatic Soft X-Rays  
*J. Murakami, M. C. Nelson, S. L. Anderson, and D. M. Hanson* (State  
 University of New York-Stony Brook)
- M20 Interference Between Vibrational Levels in the Core-Hole Decay of NO  
*T. X. Carroll, S. E. Anderson, L. Ungier, and T. D. Thomas* (Oregon  
 State University)
- M21 Final State Multiplet Structures in Photoionization of the Inner-Valence  
 Shells of  $\text{NH}_3$  and  $\text{PH}_3$   
*M. N. Piancastelli* (2nd Univ. of Rome), *C. Cauletti* (1st Univ. of  
 Rome), and *M. Y. Adam* (LURE, Univ. Paris-Sud)
- M22 Dynamics of the Double Photoionization Near Threshold in Argon, Studied  
 by Coincidence Technique  
*Pascal Lablanquie, Irene Nenner, Paul Morin* (LURE, Université de  
 Paris Sud), *John H. D. Eland* (Oxford Physical Chemistry Laboratory),  
*M. J. Hubin-Franskin, and J. Delwiche* (Université de Liege)
- M23 Photoemission and Inverse Photoemission of Metal-Metal Interfaces  
*J. G. Tobin, B. J. Knapp, J. C. Hansen, and J. A. Benson* (University  
 of Wisconsin-Madison)

### WEDNESDAY POSTER SESSION

- Posters put up on Wednesday after lunch
- Poster session 4:30 - 6:00 p.m. Wednesday

- W1 Spin-Polarized Inverse Photoemission Study of Ni(001) and its Chemisorption  
*L. E. Klebanoff, R. K. Jones, D. T. Pierce, and R. J. Celotta*  
(National Bureau of Standards)
- W2 Surface Magnetism and Dipole-Allowed Electronic Excitation in EuS by Polarized Electron Scattering  
*S. F. Alvarado* (Institut für Festkörperforschung, Jülich)
- W3 Stoner Excitations in Ferromagnets as Revealed by Exchange Processes in Inelastic Spin-Polarized Electron Energy Loss Spectroscopy  
*J. Kirschner, S. Suga, and D. Venus* (Institut für Grenzflächenforschung und Vakuumphysik, Jülich)
- W4 Experimental Analysis of Band Symmetry and Hybridization in Non-Magnetic Solids via Spin-Polarized Momentum-Resolved Photoemission with Circularly Polarized Synchrotron Radiation  
*J. Kirschner, H. P. Oepen, D. Venus, J. Garbe, S. Suga, C. Schneider, and K. Hünlich* (Institut für Grenzflächenforschung und Vakuumphysik, Jülich)
- W5 Spin Polarized Photoelectron Diffraction: A New Probe of Surface Magnetic Order  
*B. Sinković, B. Hermsmeier, J. Osterwalder, and C. S. Fadley*  
(University of Hawaii)
- W6 Electronic Resonances in Spin-Resolved Photoemission from Physisorbed Atoms  
*G. Schönhense* (Universität Bielefeld)
- W7 Photoelectron Spectrometry of Atomic Mercury in the 17-40 eV Photon-Energy Range  
*B. H. McQuaide, M. S. Banna* (Vanderbilt University), *P. Gerard,* and *M. O. Krause* (Oak Ridge National Laboratory)
- W8 Differential Electron Scattering Cross Sections for the First Optically Forbidden and Resonance Transitions in MgII, ZnII, and CdII  
*R. J. Mawhorter, I. D. Williams, and A. Chutjian* (Jet Propulsion Laboratory)
- W9  $L_{2,3}$ - and  $M_{2,3}$ -Shell Electron Energy Loss Spectra of Atomic Ca  
*J. Väyrynen and M. Harkoma* (University of Oulu)
- W10 He, Ne, and Ar Photoelectron Satellites at Threshold  
*P. A. Heimann, U. Becker, H. G. Kerkhoff, B. Langer, D. Szostak, R. Wehlitz, D. W. Lindle, T. A. Ferrett, S. H. Liu, and D. A. Shirley*  
(Lawrence Berkeley Laboratory and University of California-Berkeley)

- W11 Autoionization of the Kr 3d + np Resonances  
*D. W. Lindle, P. A. Heimann, T. A. Ferrett, M. N. Piancastelli, and D. A. Shirley* (Lawrence Berkeley Laboratory and University of California-Berkeley)
- W12 Absolute Cross-Section Measurements of Metallic Vapours  
*Agneta Svensson* (Daresbury Laboratory, England)
- W13 Autoionization Resonances in Hg-6s<sup>2</sup> Photoionization  
*P. Gerard, M. O. Krause, T. A. Carlson* (Oak Ridge National Laboratory), *B. McQuaide*, and *S. Banna* (Vanderbilt University)
- W14 Local Structure Determination of the Ti/Si System by SEELFS and EAPFS  
*Yves U. Idzerda, Ellen D. Williams, T. L. Einstein, and R. L. Park* (University of Maryland)
- W15 Experimental and Theoretical Studies on Polarized XANES Spectra of Square-Planar Complexes: CuCl<sub>4</sub><sup>2-</sup> and Ni(CN)<sub>4</sub><sup>2-</sup>  
*Nobuhiro Kosugi* (The University of Tokyo)
- W16 Highly Resolved Electron Energy Loss Spectroscopy Versus Surface Reconstruction  
*J. Szeftel* (CEN, Saclay)
- W17 Near Edge Structure of C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>6</sub> on Cu (100): Fluorescence and Electron Yield Detection at the C-K Edge  
*D. Arvanitis, K. Baberschke, L. Wenzel* (Freie Universität Berlin), *U. Döbler* (SIETEC, Berlin), and *J. Stöhr* (IBM)
- W18 Near Edge X-ray Absorption Fine Structure of O on Cu: Comparison of Experiment and a Full Multiple Scattering Calculation  
*U. Döbler* (SIETEC, Berlin), *K. Baberschke* (Freie Universität Berlin), *D. D. Vvedensky*, and *J. B. Pendry* (Imperial College)
- W19 Photoemission Studies Using Synchrotron Radiation on the Catalytic Role of Alkali Metals as Efficient Promoters of Semiconductor Oxidation  
*P. Soukiassian* (University of Wisconsin-Madison), *M. H. Bakshi*, *Z. Hurych* (Northern Illinois University), and *T. M. Gentle* (Dow-Corning Co.)
- W20 Symmetry and Surface Chemistry in Angle Resolved UV Photoemission: Five-Membered Ring Systems on Rh(111)  
*F. P. Netzer, A. Goldmann, G. Rosina and E. Bertell* (Universität Innsbruck)
- W21 Surface Structures for the Oxygen/Ni(001) System from c(2x2)O to Saturated NiO  
*R. Saiki, A. Kaduwela, M. Sagurton, D. Cyr, C. S. Fadley* (University of Hawaii), and *C. R. Brundle* (IBM)
- W22 Study of Outermost Surface Layers of Organic Solids by Penning Ionization Electron Spectroscopy  
*Yoshiya Harada* (The University of Tokyo)

- W23 Photoemission Study of Cu-MnO System as a Catalyst Model  
*V. Di Castro and G. Polzonetti (University "La Sapienza")*
- W24 The Growth of Amorphous SiO<sub>x</sub> on Si-H and Si-H on SiO<sub>x</sub> Studied by High Resolution Core Level Spectroscopy  
*D. Sondericker, B. Abeles, W. Eberhardt, H. Stasiewski, and L. Yang (Exxon Research and Engineering Company)*
- W25 Spin-Resolved Photoemission of *in situ* Grown Epitaxial Fe Layers on W(110)  
*R. Kurzawa, K. P. Kämper, W. Schmitt, and G. Güntherodt (Universität Köln)*
- W26 Bonding of CO and Nitriles on W(100)-(5×1)-C: NEXAFS and HREELS Studies  
*C. M. Friend, E. K. Baldwin, J. G. Serafin (Harvard University), and Paul Stevens (Stanford University)*

# GORDON RESEARCH CONFERENCES

## ELECTRON SPECTROSCOPY

JULY 14-18, 1986  
Brewster Academy, Wolfeboro, New Hampshire

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